

PATENT ABSTRACTS OF JAPAN

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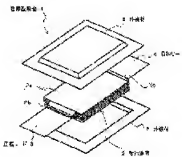
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(54) STACKED BATTERY

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the size of a part not contributing to charge and discharge, while foil break in connection to a positive electrode lead and a negative electrode lead is prevented.

SOLUTION: A stacked battery 1 has a battery element 2 formed by alternately stacking a plurality of positive electrodes comprising a current collector in which a positive electrode material is applied to both surfaces and a part where the positive electrode material is not applied is extended and a plurality of negative electrodes comprising a negative current collector in which a negative electrode material is applied to both surfaces in a larger area than the positive electrode material and a part where the negative electrode material is not applied is extended through a separator. The tip of the part where the positive electrode material is not applied is connected to the positive electrode lead 3 and the tip of the part where the negative electrode material is not applied is connected to the negative electrode lead 4. At least a part on the connection part side to the negative electrode lead 4 of the extended parts from the positive electrode applied part of the negative electrode is bent toward the connection part, and the distance of the positive electrode from the end of the positive electrode on the connection part side with the negative electrode lead 4 to the connection part with the negative electrode lead 4 is made shorter than the distance from the end of the positive electrode material applied part on the connection part side with the positive electrode lead 3 to the connection part with the positive electrode lead 3.



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2. **** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

This invention relates to the laminate type battery which carried out the hermetic seal (only henceforth "closure") of the battery element which laminated two or more anodes and negative electrodes via the separator with the sheathing material.

[Background of the Invention]

[0002]

The cell of composition of having pulled out the positive electrode lead connected to it and the negative electrode lead from the sheathing material using the battery element which laminated two or more positive pole collectors which consist of metallic foils, respectively for the purpose of performing the charge and discharge of a high current these days, and two or more negative pole collectors via the separator is proposed. It is necessary to establish the terminal area which collects the metallic foils pulled out from the laminated electrode, and connects in these leads, and welding, especially ultrasonic welding are well used for them as a connection method in the cell of such a lamination type (refer to patent documents 1).

[0003]

Considering it as the cell advantageous [weight] in size is known these days, using a film as a sheathing material. This kind of most cells are pulling out the lead of positive/negative two poles from one neighborhood of a sheathing material.

The terminal area of a metallic foil and a lead is the position estranged as the same [from the electrode laminating section] with the natural thing.

[0004]

On the other hand, as a charge collector in a rechargeable lithium-ion battery etc., copper foil is often used for the charge collector of aluminium foil and a negative electrode by the charge collector of an anode from an electrochemical characteristic side or a cost aspect. Since these both differ in conductivity, they use both in the combination which thickened the aluminium foil to copper foil in many cases.

[Patent documents 1] JP,2001-126678,A

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0005]

In the laminate type battery mentioned above, as for the terminal area of a lead and a metallic foil, if it thinks from a viewpoint of the improvement in space efficiency, the size from an electrode laminating section to a lead is a portion which does not contribute to charge and discharge, and it is preferred to carry out the neighborhood to an electrode laminating section if possible. However, on the other hand, it is necessary to also take the following into consideration.

[0006]

If the lamination number of sheets of the charge collector in an electrode laminating section increases, in order for the number of sheets of the metallic foil which should be welded in a terminal area to increase and to weld these certainly, it is necessary to set up the output of welding equipment so strongly. Since the angular difference of the metallic foil to a lead becomes large, it becomes easy to produce the foil piece by a metallic foil bending keenly at the root of a terminal area in a terminal area, as the thickness of an electrode laminating section increases. If Ambil is applied to the lead side, a phon is applied to the metallic foil side and it welds in ultrasonic welding when the sum total number of sheets of an anode and a negative electrode will be 30 or more sheets about especially, it will be easy to produce a foil piece on the boundary line of the metallic foil which the angle attached to the lead, and a terminal area. As for a terminal area, if lamination number of sheets increases [this], in order to ease the angle of the metallic foil to a lead indeed, it is desirable to make it estrange from an electrode laminating section.

[0007]

It is necessary to design the position of a terminal area, maintaining balance between the improvement in space efficiency, and the problem of a foil piece. However, in the laminate type battery known widely conventionally. Since the lead of the anode and the negative electrode was pulled out from one neighborhood as above-mentioned, the position of the terminal area was designed on the basis of the direction from which it is easy to raise the foil piece by the side of an anode and a negative electrode and the position of the lead drawer part was decided by extension, the part space efficiency was spoiled.

Although some conventional laminate type batteries considered the lead by the side of an anode, and the lead by the side of a negative electrode as the composition pulled out from the neighborhood which counters mutually. Also in this case, the example which the position of the lead drawer part was designed based on the idea mentioned above, and pulled out by the anode and negative-electrode side, designed the position independently, and attained optimization of space efficiency does not have the former.

[0008]

Preventing the foil piece in the case of welding to a lead, even if this invention is when there are much basis of such a background and lamination number of sheets of an anode and a negative electrode, the size of the portion which does not contribute to charge and discharge is reduced, and it aims at raising space efficiency.

[Means for Solving the Problem]

[0009]

As a result of this invention persons' inquiring wholeheartedly, it existed in a negative-electrode end, and on the other hand, in the drawer side of a negative electrode, a boundary of a field at which it is hard to turn among electrode laminating sections found out existing in an anode end, and resulted in this invention at the drawer side of an anode.

[0010]

Namely, two or more anodes in which a laminate type battery of this invention consists of a positive pole collector whose non-application portion of said positive electrode material a positive electrode material was applied to both sides, and extended from one side, Two or more negative electrodes which consist of a negative pole collector in which a negative pole material was applied to both sides with a large area rather than said positive electrode material, and a non-application portion of said negative pole material extended from one side, In a laminate type battery which connected a tip part of a non-application portion of said negative pole material to a negative electrode lead in piles while having the battery element laminated by turns via a separator and connecting a tip part of a non-application portion of said positive electrode material to a positive electrode lead in piles,

from an application part of said positive electrode material of said negative electrode, at least a part by the side of a terminal area with said negative electrode lead curves towards said terminal area among portions which it began to see -- and When an interval from an end of said anode by the side of b and a terminal area with said negative electrode lead to a terminal area with said negative electrode lead is set to c for an interval from an end of an application part of said positive electrode material by the side of a terminal area with said positive electrode lead of said anode to a terminal area with said positive electrode lead,

c<b

It comes out and is characterized by a certain thing.

[0011]

Thus, a size in a portion which does not contribute to charge and discharge is optimized by specifying an interval from a battery element to a terminal area with a lead about an anode and a negative electrode.

[0012]

When an interval from an end of a negative electrode by the side of a terminal area with a positive electrode lead to a terminal area of an anode and a positive electrode lead is set to p in the above-mentioned laminate type battery, $0.8p < c < 1.2p$

It comes out and a certain thing is preferred.

[0013]

It becomes possible to make small size in a direction in which a positive electrode lead and a negative electrode lead extend by having composition which laminated an anode and a negative electrode so that it might extend from a neighborhood which a non-application part of a positive electrode material and a non-application part of a negative pole material counter mutually. Decompression closure is carried out inside a sheathing material in which a cup part for forming a storage room which furthermore consists a battery element of films in this case, and stores a battery element was formed, And it becomes possible to certainly locate in a pars basilaris ossis occipitalis of a cup part a field which cannot change a battery element easily by having composition which biased toward the negative electrode lead side a field where a positive electrode material of a positive pole collector was applied, and has arranged it within a cup part.

[Effect of the Invention]

[0014]

Preventing the foil piece in the case of welding to a lead, even if it is when there is much lamination number of sheets of an anode and a negative electrode, since the connecting location of a lead is independently optimized by the anode and negative-electrode side, respectively according to this invention, the size of the portion which does not contribute to charge and discharge is reduced, and space efficiency can be raised.

[0015]

In the laminate type battery constituted so that a positive electrode lead and a negative electrode lead might extend to the direction which counters mutually, When carrying out decompression closure of the battery element into the sheathing material which consists of films, by forming the cup part for battery element storage in a sheathing material, and biasing a battery element toward the negative electrode lead side, and arranging it within this cup part, the formation of wrinkles to a sheathing material can be controlled, and it can be considered as the laminate type battery of good appearance.

[Best Mode of Carrying Out the Invention]

[0016]

Next, it explains, referring to drawings for the embodiment of this invention.

[0017]

Drawing 1 is an exploded perspective view of the laminate type battery by one embodiment of this invention, and assumes the rechargeable lithium-ion battery in this embodiment.

[0018]

The laminate type battery 1 of this embodiment is provided with the following.

The battery element 2 of the approximately rectangular parallelepiped shape which has the structure which laminated two or more anodes and negative electrodes.

The positive electrode lead 3 and the negative electrode lead 4 which were connected to the anode and negative electrode of the battery element 2, respectively.

The sheathing materials 5 and 6 which make a part of positive electrode lead 3 and negative electrode lead 4 extend, and close the battery element 2.

[0019]

The battery element 2 is provided with the following.

The electrode laminating section 2a which two or more anodes and two or more negative electrodes are laminated by turns, are constituted via the separator, is the portion by which these were laminated, and contains an electrolysis solution.

Anode relay part 2b and the negative-electrode relay part 2c which relay connection with the positive electrode lead 3 and the negative electrode lead 4, respectively.

Anode relay part 2b and the negative-electrode relay part 2c are the portions prolonged in one, respectively from the anode and negative electrode which constitute the electrode laminating section 2a, and anode relay part 2b and the negative-electrode relay part 2c are prolonged from the neighborhood of the opposite hand in each other of the battery element 2. Namely, the positive electrode lead 3 and the negative electrode lead 4 are pulled out in the direction which the laminate type battery 1 counters mutually. The detailed composition of the battery element 2 is mentioned later.

[0020]

The sheet shaped member with which electrolysis solutions, such as a micro porous film (microporous film), a nonwoven fabric, textile fabrics, etc. which were made from thermoplastics, such as polyolefin, can be impregnated can be used for a separator.

[0021]

The sheathing materials 5 and 6 consist of a laminate film of two sheets surrounded on both sides of the battery element 2 from the thickness direction both sides, it is carrying out thermal melting arrival of these overlapping edge parts, and the battery element 2 is closed. In order to form in the sheathing materials 5 and 6 the stowage which is the space which surrounds the battery element 2, it is processed into cup shape with a collar, respectively. Deep-drawing shaping can perform this processing.

[0022]

Although drawing 1 showed the example as for which thermal melting arrival carried out four sides of the circumference and which constituted them from the thickness direction both sides on both sides of the battery element 2 with the sheathing materials 5 and 6 of two sheets, it is good also as composition which closes the battery element 2 by using the sheathing material of the film state of not only it but one sheet as 2 chip boxes, pinching the battery element 2, and carrying out thermal melting arrival of the three sides opened wide.

[0023]

Next, a detailed structure near the anode relay part 2b and a detailed structure near the negative-electrode relay part 2c are explained with reference to drawing 2 and drawing 3, respectively.

[0024]

As mentioned above, this embodiment assumes the rechargeable lithium-ion battery, and the area of the negative pole material application part in a negative electrode is larger than the area of the positive electrode material application part in an anode. That is, the negative pole material spreading end 22a is located outside the positive electrode material spreading end 12a. As for this exaggerated quantity, 0.5-2 mm is preferred. In order to prevent a short circuit with the anode 10 and the negative electrode 20 in connection with this, the separator end 31 which is an end of the separator 30 is located to some extent outside rather than the negative pole material spreading end 22a. As for this exaggerated quantity, 0.5-2 mm is preferred.

[0025]

First, the structure by the side of an anode is explained in detail with reference to drawing 2.

[0026]

The anode 10 has the positive pole collector 11 in which it consisted of aluminium foil and the positive electrode material was applied to the main part of the both sides. The non-application part 13 whose positive pole collector 11 is a portion to which the positive electrode material is not applied from one side of the positive pole collector 11 by the most serving as the positive electrode material application part 12 by which the positive electrode material was applied to both sides in the field of the electrode laminating section 2a is prolonged. This non-application part 13 is the position which carried out specified quantity alienation, is collected outside the separator end 31 in the state where it put on the positive electrode lead 3 which consists of flat metal plates, and is connected to it by welding. In deciding the position of the terminal area 40 of the non-application part 13 of this positive pole collector 11, and the positive electrode lead 3, the following cautions are

required.

[0027]

If change of the thickness from the electrode laminating section 2a to the terminal area 40 is seen toward the terminal area 40 from the positive electrode material application part 12 of the anode 10, thickness will decrease by the coating thickness of a positive electrode material in the position of the positive electrode material spreading end 12a first. Next, thickness decreases by the thickness of the negative electrode 20 at the negative pole material spreading end 22a, and thickness decreases by the thickness of the separator 30 at the separator end 31 further. And eventually, only the non-application parts 13 are collected on the positive electrode lead 3, and reach to the terminal area 40.

[0028]

Thus, in order to collect the positive pole collectors 11 with the breadth (interval) same from the first as the thickness of the electrode laminating section 2a and to form the terminal area 40 by welding and sticking by pressure of ultrasonic welding etc., If the position of the terminal area 40 is too close to the electrode laminating section 2a, in the root 40a of the terminal area 40, the positive pole collector 11 which is aluminium foil will bend strongly, and it will be easy to raise a foil piece. In ultrasonic welding, since especially a phon hits against the usually soft member side and adds supersonic vibration, Ambil is applied to the positive electrode lead 3 side, a phon is applied to the positive pole collector 11 side, and it welds in many cases. For this reason, the foil piece of the positive pole collector 11 happens easily by a boundary part with a phon. What is necessary is to fully separate the position of the terminal area 40 from the electrode laminating section 2a, and just to make it control that the positive pole collector 11 bends, in order to prevent a foil piece. However, if distance from the electrode laminating section 2a to the terminal area 40 is enlarged too much, size increase of the whole cell will be caused and volumetric efficiency will worsen. Then, the position of the terminal area 40 maintains and designs both balance.

[0029]

Next, the structure by the side of a negative electrode is explained in detail with reference to [drawing 3](#).

[0030]

The negative electrode 20 has the negative pole collector 21 in which it consisted of copper foil and the negative pole material was applied to the main part of the both sides. The non-application part 23 whose negative pole collector 21 is a portion to which the negative pole material is not applied from one side of the negative pole collector 21 by the most serving as the negative pole material application part 22 by which the negative pole material was applied to the both sides in the field of the electrode laminating section 2a is prolonged. As mentioned above, the area of the negative pole material application part 22 is larger than the area of the positive electrode material application part 12 in the anode 10, and the negative pole material application part 22 has covered the positive electrode material application part 12 thoroughly. The non-application part 23 is the position which carried out specified quantity alienation, are collected outside the separator end 31 in the state where it put on the negative electrode lead 4 which consists of flat metal plates, and are connected to it by welding.

[0031]

In deciding the position of the terminal area 41 of the non-application part 23 of this negative pole collector 11, and the negative electrode lead 4, the same cautions as the anode side are required. That is, the position of the terminal area 41 maintains and designs balance between improvement in volumetric efficiency, and the problem of a foil piece.

[0032]

As shown in [drawing 2](#), in order to prevent the fall of the thermal melting arrival nature by a metal plate intervening in between on the occasion of the thermal melting arrival of the sheathing materials 5 and 6, the sealant 51 is formed in the field by which thermal melting arrival is carried out to the sheathing materials 5 and 6 of the positive electrode lead 3. Similarly, as shown in [drawing 3](#), the sealant 52 is formed also in the field by which thermal melting arrival is carried out to the sheathing materials 5 and 6 of the negative electrode lead 4. As shown in [drawing 2](#) and [drawing 3](#), each terminal areas 40 and 41 of the anode and negative-electrode side are covered with the protective films 56 and 57, respectively.

[0033]

About each position of the terminal area 40 of the anode side, and the terminal area 41 of the negative-electrode side. As a result of this invention persons' inquiring wholeheartedly, the interval in the direction of a drawer of the positive electrode lead 3 of the positive electrode material spreading end 12a in anode relay part 2b, and the root 40a of the terminal area 40 b, When the interval in the direction of a drawer of the negative electrode lead 4 of the end of the anode 10 in the negative-electrode relay part 2c and the root 41a of the terminal area 41 was set to c, and the position of the terminal areas 40 and 41 was designed become a relation as for which $c < b$ becomes, the desirable thing became clear.

[0034]

For example, on the basis of the positive electrode material application part 12 the position of the terminal area 40 of the positive electrode lead 3 side from the boundary. After setting up so that the foil piece of the positive pole collector 11 may not happen at the time of ultrasonic welding, the conventional view had also set up the position of the terminal area 41 of the negative electrode lead 4 side at the same interval (the same interval as the interval from the positive electrode material spreading end 12a to the root 40a of the terminal area 40) as having set up by the anode side. However, as a position of the terminal area 41 which does not raise the foil piece of the negative pole collector 21, It became clear that it was possible for it to be generous in the direction which approached the electrode laminating section 2a more, to make small size (size of the negative-electrode relay part 2c) from the electrode laminating section 2a to the terminal area 41 of the negative-electrode side so much, and to raise space efficiency.

[0035]

In the rechargeable lithium-ion battery which pulled out the lead like this embodiment especially in the direction which

counters mutually in positive and negative poles, the sheathing-material size of the direction of a lead drawer can be contracted, and an effect is large. Also in the laminate type battery of composition of having pulled out the lead of positive and negative poles from one neighborhood incidentally. Although volume of a negative-electrode relay part can be made small and the lead drawer part by the side of an anode will differ in outline shape from the lead drawer part by the side of a negative electrode by bringing the terminal area of the negative-electrode side close to an electrode laminating section. Only the sheathing-material portion of the lead drawer part by the side of a negative electrode can also be made into the shape made small inside.

[0036]

As mentioned above, the following things can be considered as a reason the optimal terminal area positions differ with an anode and a negative electrode.

[0037]

(1) Difference in the thickness of the charge collector in an anode and a negative electrode :

In a rechargeable lithium-ion battery, since the negative pole collector 21 uses the metallic foil thinner than the positive pole collector 11, a negative-electrode side is easier to bend a charge collector compared with the anode side, and it may say that it is so easy to bring the terminal area 41 close, as what can be said first was mentioned above.

[0038]

(2) Difference in the coating thickness of the negative pole material by the side of a positive electrode lead and a negative electrode lead :

In drawing 2, since the negative pole material spreading end 22a by the side of anode relay part 2b disconnects the negative pole collector 21 in which the negative pole material was applied from on a coating film, the cut end has clarified. On the other hand, since the spreading end is formed by stopping the flow of negative electrode mixture by a shutter when applying negative electrode mixture on the negative pole collector 21 with a doctor blade method etc. at the negative electrode lead 4 side, in the end of the negative pole material application part 22, thickness does not serve as a sharp level difference, but serves as a termination of the tapered shape coating film which generally lengthened about 0.5-2-mm foot. Therefore, in drawing 3, as for the about 0.5-2-mm portion which is a portion protruded from the end of the anode 10, the thickness of the negative electrode 20 tends to become thin. Although the end of the negative electrode 20 is formed to the termination and the negative pole material film of regulation thickness cannot turn at it easily in the positive electrode lead 3 side in drawing 2, compared with the end of the negative electrode 20 by the side of the positive electrode lead 3, it is easy to turn at the negative pole material application part 22 for the reason mentioned above in the field protruded from the anode 10 in drawing 3.

[0039]

therefore -- if the negative pole collector 21 is collected and welded to the negative electrode lead 4 side toward the terminal area 41 -- the anode 10 -- the negative pole material application part 22 curves toward the terminal area 41 outside immediately. Also when decompression closure is carried out with the sheathing materials 5 and 6, the negative electrode 20 will be pushed by atmospheric pressure with the sheathing materials 5 and 6, and the negative pole material application part 22 will be too bent toward the height position [in / immediately / at the outside / the thickness direction of the battery element 2] of the terminal area 41 of the anode 10 in a similar manner.

[0040]

(3) Difference in the laminated structure by the side of a positive electrode lead and a negative electrode lead :

As shown in drawing 2, in the positive electrode lead 3 side. As the end of the negative electrode 20 is shown in drawing 3, to the non-application part 13 of the separator 30 and the positive pole collector 11 intervening between each negative electrode 20 in the negative electrode lead 4 side. In the field which the negative pole material application part 22 protruded from the anode 10, the member does not intervene between each negative electrode 20 other than separator 30. The separator 30 is a thin resin layer and it is easy to turn at it. Therefore, in the negative electrode lead 4 side, a level difference is large and it is easy to turn at the end of the anode 10 at it.

[0041]

There is a tendency for the boundary of the field at which members forming of the electrode laminating section 2a cannot turn easily to serve as an end of the negative electrode 20 in the positive electrode lead 3 side, and to serve as an end of the anode 10 by the negative electrode lead 4 side by the above thing. When decompression closure is carried out with the sheathing materials 5 and 6 of film state, the negative electrode 20 tends to serve as the position as an above position in which the boundary of the superficial portion of the cell outside at this time also has the same eclipse **** with aggressiveness with the sheathing materials 5 and 6 with atmospheric pressure.

[0042]

Therefore, it will become the optimal position if the position of the terminal areas 40 and 41 of each positive and negative poles is designed with the size which is made into a standard from the end of the anode 10 in the negative electrode lead 4 side, respectively, and a foil piece does not produce from the end of the negative electrode 20 in the positive electrode lead 3 side. In the case of a rechargeable lithium-ion battery, generally, the coated area of a negative pole material is larger as compared with the coated area of a positive electrode material. For this reason, when the above-mentioned indicator designs, it becomes c<b inevitably. As a result, even if the lamination number of sheets of the anode 10 and the negative electrode 20 is many cases so that it may become 30 or more sheets in total, for example, The foil piece of the positive pole collector 11 and the negative pole collector 21 can be prevented making small size of the field outside the electrode laminating section 2a which contributes to charge and discharge, and improving space efficiency.

[0043]

When the interval in the direction of a drawer of the positive electrode lead 3 of the end of the negative electrode 20 in anode relay part 2b and the root 40a of the terminal area 40 is preferably set to p in drawing 2, if it designs become the interval c which showed drawing 3 this interval p with the same size substantially, the position of the terminal areas 40 and 41 can be designed the optimal.

[0044]

The interval p can be adjusted in the range from which it does not need to be strictly [as the interval c] the same, and the above-mentioned effect is acquired. When the size of c is specifically designed on the basis of the size by the side of the positive electrode lead 3 which a foil piece tends to produce, the possibility of a foil piece becomes it high that c is below 0.8p, it is one side, and if c becomes more than 1.2p, the effect of space efficiency will become is hard to be acquired. Therefore, if it is the range of $0.8p < c < 1.2p$, it will be thought that the effect of this invention is acquired.

[0045]

A dashed line shows a position with preferred battery element storage predetermined position to a sheathing material and lead sealed part sealant predetermined position to drawing 4, respectively. As shown in drawing 4, the position of the cup part 61 for the storage of the battery element 2 to the outside of the sheathing materials 5 and 6 is symmetrical at the anode and negative-electrode side. The physical relationship of the sealant 51 and 52 to the electrode laminating section 2a differs by the anode and negative-electrode side, and c+d is small in drawing 4 as compared with a+b. Here, b and c mean the interval mentioned above, respectively. As a is shown in drawing 2, it is an interval from the root 40a of the terminal area 40 in the positive electrode lead 3 side to the sealant 51, and d is an interval from the root 41a of the terminal area 41 in the negative electrode lead 4 side to the sealant 52, as shown in drawing 3.

[0046]

The physical relationship of the sealant 51 and 52 and the sheathing materials 5 and 6, Since the end of the sheathing materials 5 and 6 is made into a seal area, the anode side and negative-electrode side is also the same, therefore the position of the electrode laminating section 2a and especially the position of the positive electrode material application part 12 in the positive pole collector 11 incline toward the negative electrode lead 4 side in the field of the cup part 61 of the sheathing materials 5 and 6. Since the way of the positive electrode lead 3 side is difficult to turn at the end of the negative electrode 20 compared with the negative electrode lead 4 side as mentioned above, as an outside of the battery element 2 whole, it is more convenient for a superficial portion to think that it has spread to a negative-electrode end in the positive electrode lead 3 side which the boundary of a superficial portion falls steeply in the negative electrode lead 4 side, and serves as a loose slant face compared with it in the positive electrode lead 3 side. In this way, it becomes that it is easy to coincide the superficial portion of the outside of the battery element 2 with the bottom 61a of the cup part 61 of the sheathing materials 5 and 6 by biasing the position of the electrode laminating section 2a toward the negative-electrode side. When decompression closure is carried out by this, the formation of wrinkles to the sheathing materials 5 and 6 by the disagreement of the contents shape of the sheathing materials 5 and 6 and sheathing-material shape is controlled. This effect is effective when the symmetrical [at the anode and negative-electrode side / with reversal]-shaped sheathing materials 5 and 6 are used, as especially shown in drawing 4.

[0047]

Here, deep-drawing shaping can perform processing of the cup part 61 to the sheathing materials 5 and 6, in this case, it originates in the shape of punch and the boundary part of the bottom 61a of the cup part 61 and the side 61b serves as shape which curved although it was small. Therefore, in deciding the position of the battery element 2 to the cup part 61, it is preferred that also take into consideration the curved portion of this cup part 61, and the superficial portion of the battery element 2 sets up so that it may be located inside the curved portion of the boundary part of the bottom 61a of the cup part 61 and the side 61b.

[0048]

As mentioned above, although the typical embodiment of this invention was described, it supplements about the composition of each part of the laminate type battery which can apply this invention to below.

[0049]

(Electrode lead)

As the construction material, the lead of an anode and a negative electrode can use aluminum, Cu, nickel, Ti, Fe, phosphor bronze, brass, stainless steel, Cu that carried out nickel plating, aluminum which carried out nickel plating, etc., and may perform annealing processing if needed. As for the thickness of a lead, 0.08-1.0 mm is preferred.

[0050]

It is also preferred to perform the surface treatment for raising adhesion with a sheathing material into the portion of a lead to which it is stuck with a sheathing material at least. The surface roughening process according to chemical etching processing etc. for example as this kind of a surface treatment, The surface treatment by the corrosion resistance film ground treatment by the oxide layer formation by electrolytic formation, the film formation which consists of a partial amination phenol system polymer, a phosphoric acid compound, and a titanium compound, a zinc phosphate system coat, etc., a titanate coupling agent, an aluminate system coupling agent, etc., etc. are mentioned.

[0051]

It is preferred to weld beforehand the resin layer containing metal-bonding nature resin to a lead. What is pasted up on the surface of the lead terminal which is a flat metal plate as metal-bonding nature resin is used, for example, it is usable in acid denaturation polypropylene, acid modified polyethylene, an acid denaturation poly (ethylene-propylene) copolymer, an

ionomer, etc.

[0052]

(Sheathing material)

It is possible to cover a battery element, as a sheathing material, especially if it has pliability, it is not limited, so that an electrolysis solution may not be revealed, but the laminate film which laminated the metal layer and the thermal melting arrival nature resin layer is used especially preferably. As this kind of a laminate film, what stuck 3 micrometers - 200 micrometers-thick thermal melting arrival nature resin can be used for a 10 micrometers - 100 micrometers-thick metallic foil, for example. As construction material of a metallic foil, aluminum, Ti, a Ti system alloy, Fe, stainless steel, Mg system alloy, etc. can be used. As thermal melting arrival nature resin, polyester, such as polypropylene, polyethylene, these acid conversion things, a polyphenylene sulfide, and polyethylene terephthalate, etc. can use polyamide, an ethylene-vinylacetate copolymer, etc.

[0053]

The cup part which constitutes the stowage of a battery element may be formed in the sheathing material by the side of thickness direction both sides of a battery element, and may be formed only in the one side. It is good also as composition which closes a battery element by not forming a cup part in a sheathing material, but changing a sheathing material according to the outside of a battery element using the pliability of a sheathing material.

[0054]

(An anode and a negative electrode)

An anode will not be limited especially if the thing which absorbs a positive ion at the time of discharge, or an anion is emitted, (i) LiMnO_2 and LiMn_2O_4 , LiCoO_2 , Metallic oxides, such as LiNiO_2 etc. and manganic acid lithium with Spinel structure, (ii) Conductive polymers, such as polyacetylene and poly aniline, (iii) general formula $(\text{R-Sm})_n$ (aliphatic series or aromatic series, and S of R are sulfur, for m and n) the integer of $m \geq 1$ and $n \geq 1$ -- it is -- a publicly known thing that can be conventionally used as a positive electrode material of rechargeable batteries, such as disulfide compounds (dithioglycol, 2, 5-dimercapto 1 and 3, 4-thiadiazole, the S-triazine 2 and 4, 6-trithiol, etc.) shown. It can mix with a suitable binder and high-performance material to an anode, and positive active material (not shown) can also be formed in it. Containing halogen polymers, such as polyvinylidene fluoride, etc. as these binders as high-performance material. The polymer electrolytes for securing conductive polymers, such as acetylene black for securing electron conductivity, polypyrrole, and poly aniline, and ion conductivity, those complexes, etc. are mentioned.

[0055]

Especially if a negative electrode is the material which can emit [occlusion and] a cation, it will not be limited, The amorphous carbon etc. which are produced by heat-treating crystalline substance carbon, such as graphitized carbon produced by heat-treating natural graphite, coal, a petroleum pitch, etc. at an elevated temperature, coal, petroleum pitch coke, acetylene pitch coke, etc. can be used.

[0056]

As an electrolysis solution impregnated with a battery element, for example Ethylene carbonate, Propylene carbonate, dimethyl carbonate, diethyl carbonate, Methyl ethyl carbonate, gamma-butyrolactone, N,N'-dimethylformamide, Dimethyl sulfoxide, N-methyl pyrrolidone, m-cresol, etc., To an available polar high basic solvent, as an electrolysis solution of a rechargeable battery, Li and K, The cation of alkaline metals, such as Na , ClO_4^- , BF_4^- , PF_6^- , CF_3SO_3^- , $(\text{CF}_3\text{SO}_2)_2\text{N}^-$, $2(\text{C}_2\text{F}_5\text{SO}_2)\text{N}^-$, (CF_3SO_2) What dissolved the salt which consists of an anion of the compound containing halogen, such as C_3^- and $3(\text{C}_2\text{F}_5\text{SO}_2)\text{C}^-$, is mentioned. the solvent and electrolyte salt which consist of these basic solvents -- independence -- or two or more sets are seen and it can also use. It is good also as a gel electrolyte made into the polymer gel containing an electrolysis solution. A small amount of sulfolane, dioxane, dioxolane, 1, 3, 4-PURO broad sultones, tetrahydrofurans, vinylene carbonate, etc. may be added.

[0057]

Although the above is a material system as a rechargeable lithium-ion battery, this invention can be applied also to a lead battery, a nickel-cadmium battery, and a nickel hydride battery. This invention can be applied not only to a cell but to an electric double layer capacitor, a nonaqueous electrolyte capacitor, etc.

[Example]

[0058]

Hereafter, the concrete example of this invention is described.

[0059]

The positive electrode mixture containing manganic-acid-lithium powder with Spinel structure was applied to both sides of aluminum foil with a thickness [used as a positive pole collector] of 20 micrometers using the doctor blade. The whole thickness was set to 125 micrometers. At the time of spreading of positive electrode mixture, the non-application part (portion which the positive pole collector has exposed) was also formed by performing intermittent spreading of positive electrode mixture by opening and closing of a shutter. Also including the non-application part of positive electrode mixture, this was started to the rectangle in the size of 137 mm x 65 mm, and was made into the anode. In this way, the obtained anode was prepared 32 sheets. The size of a positive electrode material application part shall be 120 mm x 65 mm, and the area is 7800-mm^2 . Although set to 17 mm in this stage, the drawer length of the non-application part of positive electrode mixture is cut to an even length after electrode layered product formation, and is shortened so that it may mention later.

[0060]

On the other hand, the negative electrode mixture containing amorphous carbon powder was applied to both sides of copper foil with a thickness [used as a negative pole collector] of 10 micrometers using the doctor blade. The whole thickness was set to 115 micrometers. Also including the non-application part of negative electrode mixture, this was started to the rectangle in the size of 137 mm x 69 mm, and was made into the negative electrode. In this way, the obtained negative electrode was prepared 33 sheets. The size of a negative pole material application part shall be 124 mm x 69 mm, and the area is 8556-mm^2 . Although set to 13 mm in this stage, the drawer length of the non-application part of negative electrode mixture is cut to an even length after electrode layered product formation, and is shortened so that it may mention later.

[0061]

Via the separator which consists of microporous film with a thickness [made from polypropylene] of 25 micrometers, the anode prepared as mentioned above and the negative electrode were laminated by turns so that the outermost layer might serve as a negative electrode, and the electrode layered product was obtained. Direction of an anode and a negative electrode was arranged so that it might become when laminating an anode and a negative electrode the side which a positive electrode mixture non-application part and a negative electrode mixture non-application part counter. The separator performed a size design and position **** so that four sides might be protruded every 2 mm rather than negative-electrode coating regions, respectively.

[0062]

Next, before connecting the non-application part of positive and negative poles, and a positive-and-negative-poles lead, the non-application part of positive and negative poles was brought together in the connection schedule part, respectively, and it pressed down with a clip. In this state, about the non-application part of the anode, it is a position from which the drawer length from a central positive electrode mixture application part end is set to 12.5 mm about the laminating direction of an anode, and the anode non-application part of total layers was cut collectively and cut to an even length. The negative-electrode non-application part of total layers was similarly cut collectively and cut [laminating direction / of the negative electrode] to an even length about the negative electrode in the position from which the drawer length from a central negative electrode mixture application part end is set to 8.5 mm.

[0063]

Next, the positive electrode material non-application parts of the anode of 32 sheets were collected on the aluminum plate with a thickness [used as a positive electrode lead] of 0.1 mm, and ultrasonic welding of the phon was applied and carried out to the positive electrode material non-application part side. Similarly the negative pole material non-application parts of the negative electrode of 33 sheets were collected on the nickel board with a thickness [used as a negative electrode lead] of 0.1 mm, and ultrasonic welding of the phon was applied and carried out to the negative pole material non-application part side. Subsequently, thermal melting arrival of the sealant which becomes a positive electrode lead and a negative electrode lead from conversion polypropylene, respectively was carried out.

[0064]

The size of each part in drawing 2 and drawing 3 was set to $a=5.5\text{ mm}$, $b=8.5\text{ mm}$, $p=6.5\text{ mm}$, $c=6.5\text{ mm}$, and $d=5.5$. The length of anode relay part 2b in the direction of a drawer of a lead set the length of 12.5 mm and the negative-electrode relay part 2c to 10.5 mm (negative electrode mixture is applied 2 mm of them). An anode (aluminium foil) and a negative electrode (copper foil) do not have a foil piece, respectively, either, and have been welded to the positive electrode lead and the negative electrode lead good. The neighborhood of a negative pole material coating-regions boundary by the side of the drawer of the negative pole material non-application part after welding (only henceforth the negative-electrode side) was curving toward the weld zone with a negative electrode lead.

[0065]

Although it tried to make the size of b smaller than the above-mentioned value for comparison, it was easy to carry out the foil piece of the aluminium foil.

[0066]

Next, the above-mentioned electrode layered product which included the electrolysis solution in the sheathing material of the outside (positive-and-negative-poles side symmetry type **) as shown in drawing 4 was stored, and decompression closure was carried out. A sheathing material carries out deep-drawing shaping of the laminated film of the aluminum layer of 40-micrometer thickness, and the polypropylene resin layer of 40-micrometer thickness at cup shape. As the mutual position of a sheathing material and an electrode layered product was shown in drawing 4, the sealant position was doubled with the position same on a sheathing-material standard also as the positive-and-negative-poles side, and the electrode laminating section was biased toward the negative-electrode side. The interval from a positive electrode material application part to the end at the bottom of a cup part of a sheathing material was set to 4 mm by the anode side, and it was made to be set to 2 mm by the negative-electrode side. By defining the depth of a cup part suitably, even if it carried out decompression closure, it did not generate in a sheathing material but the wrinkle was able to be made it with the smooth outside surface.

[0067]

When decompression closure of the above-mentioned interval was carried out using the same sheathing material by the physical relationship set to 3 mm also with the positive-and-negative-poles side for comparison, in the sheathing material, the wrinkle occurred near 4 corners.

[Brief Description of the Drawings]

[0068]

[Drawing 1] It is an exploded perspective view of the laminate type battery by one embodiment of this invention.

[Drawing 2] It is a sectional view showing a detailed structure near the anode relay part of the laminate type battery shown in drawing 1.

[Drawing 3] It is a sectional view showing a detailed structure near the negative-electrode relay part of the laminate type battery shown in drawing 1.

[Drawing 4] It is a top view of the laminate type battery shown in drawing 1.

[Description of Notations]

[0069]

1 Laminate type battery

2 Battery element

2a Electrode laminating section

2b Anode relay part

2c Negative-electrode relay part

3 Positive electrode lead

4 Negative electrode lead

5 and 6 Sheathing material

10 Anode

11 Positive pole collector

12 Positive electrode material application part

12a Positive electrode material spreading end

13 (Positive electrode material) A non-application part

20 Negative electrode

21 Negative pole collector

22 Negative pole material application part

22a Negative pole material spreading end

23 (Negative pole material) A non-application part

30 Separator

31 Separator end

40 and 41 Terminal area

40a and 41a Root

[Translation done.]

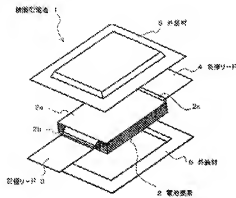
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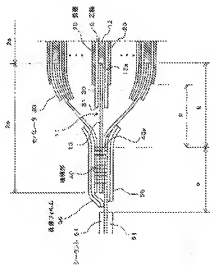
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DRAWINGS

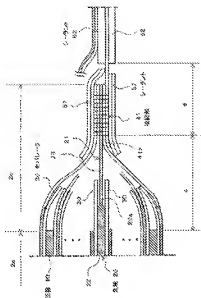
[Drawing 1]



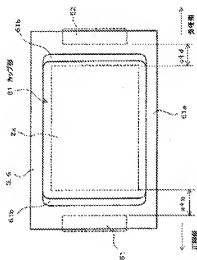
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]